

	Number.	Error.	Correction.
viz.	11003	29	30
which should be	11003	39	30

The origin of this inaccuracy is clear: Vlacq has 39, the 3 being a misprint for 2; Vega corrected this, and printed 29; the remaining unit error of course is an error of calculation.

It would be very useful to examine all the errors in Vlacq which could affect a table of seven-figure logarithms, and give these in a list by themselves: such a list would occupy little space, and would be very valuable, as by means of it, anyone could easily render any seven-figure table free from the hereditary errors that have descended from Vlacq. In a paper entitled, "Notice respecting some errors common to many tables of logarithms" (*Memoirs of the Royal Astronomical Society*, vol. III. 1829), Babbage has noticed six errors that occur in Vlacq, and have been reproduced in nearly all subsequent tables. Out of 22 tables which he has included, the errors occur in all that are intermediate to Vlacq and Vega, and in several that are more recent, the only ones free from them being the Vegas, the later editions of Callet and Hutton, and Babbage. Even tables published since Babbage's contain some of these errors: thus five out of the six appear in Shortrede, and one in Sang's tables (1871). Another of Vlacq's errors also appears both in Babbage and Sang (see *Athenæum*, June 8 and 15, 1872), so that even by editors of logarithmic tables all the Vlacq's errors that have been published are not known.

This suggested list of errata in seven-figure logarithms, which, by the aid of Lefort, can now be rendered probably really complete, I intend to form at once.

The following errata in former paper may be noted here, viz. p. 258, line 4, "Diff" should be inserted after 3192; p. 259 (note), Hatton should be Hutton, and p. 262; "Leipsiæ" should be "Lipsiæ."

Eclipse Photography. By A. Brothers, Esq.

It may, perhaps, be thought remarkable, that the photographs taken in India during the Eclipse in December last, do not show the outer corona, and its absence from the negative would almost lead to the supposition that the outer rays had no existence during this eclipse. But as we have the evidence of Captain Tupmann, that he traced those outer rays to about 40' from the Moon's limb, the inquiry naturally arises, why do not the photographs show this part of the phenomenon?

I am strongly of opinion that any such effect of light visible to the naked eye, if of sufficient duration, can be photographed; and, as the outer corona is persistent during the whole time of

totality, and clearly visible in the No. 5 Syracuse negative, it is, I think, desirable to consider the reasons why this single photograph shows an effect which is not seen in any of the photographs taken at Bekul, or at Dodabetta.

The No. 5 negative was exposed 8 seconds, and was developed in the ordinary way with iron, but not strengthened, care being taken that the development should not be pushed too far so as to obscure detail. As the denser part alone was visible in the dark room, it was only on the negative being viewed in the full daylight that the faint part of the corona could be seen, and then chiefly by reflected light.

That the effect on the plate is really a picture of the corona is proved in various ways. The light shades off gradually from the bright parts of the corona, and there is no photographic effect where the rifts occur. The faint corona was visible to the unaided eye, and was identical with the appearance photographed. Now as the negative is altogether untouched, why is it that it shows an effect which none of the Indian negatives exhibited? The reason appears to be that the difference is probably due to manipulation. The No. 5 negative shows what was actually visible, but it happened that the exposure and developments were just right for bringing out such detail.

A careful examination of Mr. Davis's negatives will show the cause of the difference between them and the Syracuse picture.

The Bekul negative No. 1 was exposed 15 seconds, and shows a corona extending about 15' from the Moon's limb.* No. 2 was exposed 10 seconds, but shows a corona of only about 8' extent. No. 4, however, was also exposed 10 seconds, but shows the coronal rays extending in some directions about 20', with indications that they reached a still greater distance from the Moon. As the conditions were, I believe, the same during the whole time of the eclipse, there would be no variation in the light to account for these differences, and we must fall back on the manipulation and time of exposure for our explanation.

As I have not seen Colonel Tennant's photographs, I cannot refer to them in detail, but it has been stated that they present very much the same appearance as those taken by Mr. Davis, and my remarks therefore refer to the Bekul negatives only.

Those of the Fellows of this Society who are familiar with the practice of photography, will at once understand what is meant by manipulation; but to make my intention quite clear, I have prepared three photographs to illustrate the matter. They are copies of my drawing from the Syracuse negative. The exposure for each picture was the same; 5 seconds, and in the same light. The print marked A presents only the bright part of the corona; B shows the proper effect of the drawing; and C shows the effect

* I am speaking with reference to the transparent copies kindly sent me by Lord Lindsay. The original negatives will probably show different measures, and other transparent copies will differ; those I have, are very perfect and beautiful; but the argument is the same in any case.

of pushing the development too far.* The examination of these photographs leaves no doubt that such a faint object as the outer corona would only be depicted on the plate when the development and time of exposure had been exactly suited for it—under-development in the one case would prevent its appearance on the plate; and in the case of over-development, it would be quite possible to obliterate all trace of it.

Seeing then that of the six or seven good pictures taken during the late eclipse, not one shows the full extent of the outer corona, it must be concluded that the operators have not succeeded in so accommodating the exposures and development as to obtain the result which the Syracuse picture fortunately, but as I am inclined to believe accidentally, shows.

The failure, however, in obtaining the full picture of the corona, may possibly be explained in another way. It was early morning when the Bekul photographs were taken; and at Doda-betta the eclipse was observed through a mist. This mist was not sufficient to obscure the details of the inner corona, but photographically the interference may have been fatal for the fainter rays. Those who have attempted to photograph the Moon know very well the effect of the slightest mist in the atmosphere; and it must be borne in mind that the outer coronal rays are fainter, very much fainter, than the light of the full Moon.

At the last Meeting of this Society, Colonel Tennant is reported to have said, that “of course” the photographs do not show all the eye could see. From what I have said, and from the fact that the Syracuse picture does show what the eye saw, I cannot entertain Colonel Tennant’s opinion. What the eye can see can be depicted photographically (the atmospheric conditions being favourable), but I am not at all sure that we have hitherto adopted the proper means to secure the best pictures of an eclipse. It is probable that the Syracuse photograph is one of the fortunate successes which occur in the experience of every photographer. Following the same means, it is not certain that the same thing can be done again; but there is strong reason for the opinion, that by using the old, but now almost forgotten *positive* process, the kind of picture required could be obtained with certainty. A positive on glass gives the picture by reflected light; but if the picture be viewed by transmitted light, we have the effect of a negative. We by this means secure two objects—the brighter corona, which requires so much less time to impress its details, would be seen by transmitted light, and the full picture by reflected light.†

The opinion has been expressed that better work could have

* These photographs were exhibited at the meeting, and will be again shown at the meeting of November 8.

† With the box of chemicals, &c. which I prepared for Colonel Tennant, I sent everything requisite for working the positive process, thinking it probable that some of the pictures might be taken in the way I suggested; but as only negatives have been spoken of, I conclude the suggestion was not acted on.

1872MMBAS-32-290B
been done with a reflecting telescope during the last eclipse, than with the rapid rectilinear lens used by Colonel Tennant and Mr. Davis. When we bear in mind what has actually been done by the various classes of instruments, it is difficult to find a reason for the opinion referred to. It cannot be said that the refracting telescope has altogether failed, as I have before me as I write, a very beautiful photograph of the corona, printed direct from the original negative taken at Shelbyville by Mr. Whipple, in August 1869. We have also the picture taken in Spain in 1870. The Shelbyville photograph is $\frac{7}{8}$ of an inch in diameter; it was exposed 40 seconds, and shows a corona extending about 6'. The Cadiz picture is less perfect, but it was exposed $1\frac{1}{2}$ minutes. In these two photographs we have the best work hitherto done with the ordinary telescope. (I do not refer to the 1860 photographs, because the prominences were the chief objects to be depicted, and the corona shown is very limited in extent.)

The silvered-glass reflector was used first in India in 1868, for the purpose chiefly of photographing the red prominences, and the negatives were obtained with exposures ranging from 1 to 10 seconds. Judging from the plates engraved in the *Memoirs* of this Society, the longest exposure was not sufficient to show the corona. A similar reflector was used by Lord Lindsay in Spain, but from some reason not hitherto explained (possibly owing to atmospheric causes) the corona is not seen in a satisfactory manner. It is probable, however, that owing to the focus of the telescope being short, as compared with the aperture, there is more light around the dark Moon than in any other eclipse photograph taken with a reflector.

The larger image obtainable with the instrument of long focus is its only advantage. As, however, a longer exposure is requisite, we lose in one way all the advantage gained in the other. Instruments of long focus are objectionable, on account of the large mounting required, and for other reasons.

On the whole, it appears to me that the evidence is in favour of an achromatic object-glass. I do not maintain that the rapid rectilinear lens is the best that can be had, but it is possible that a lens of similar construction of large aperture, and giving a picture of the Sun of about half an inch in diameter, would work more satisfactorily than a reflector of equal proportions. Such instruments, as I have indicated, could be tried side by side on the Moon. The best effect with the shortest possible exposure are the points to be tested. The most perfect driving clock in the world will not avail against atmospheric disturbance.

When the *extent* of the corona is referred to, it would be advisable, in all cases, if the observer would state whether a naked eye or telescopic view is referred to, as it appears to be pretty certain that the telescope fails to show more than the brighter parts.

It should be distinctly understood that in what I have said I disclaim all intention of undervaluing the work of others, as I

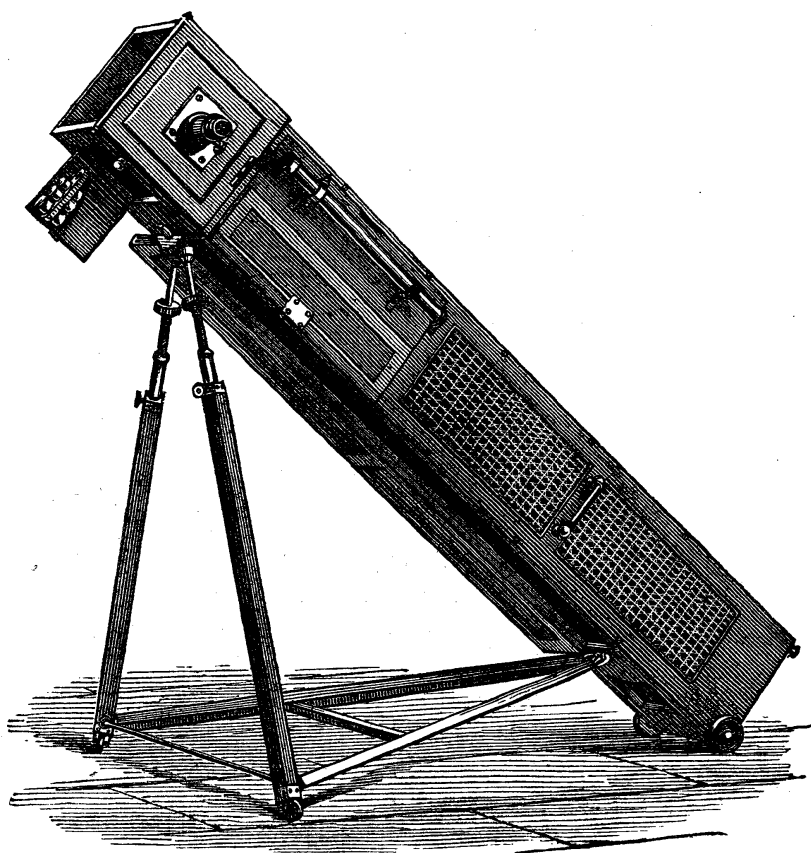
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think what has been done is so near perfection that it is difficult to conceive anything superior to be done, when the particular character of the corona is taken into consideration.

June 12, 1872.

On an Altazimuth Mounting for Telescopes, especially adapted for the use of Observers who have no permanent Observatory.
By John Brett.

The engraving intended to illustrate this paper represents a reflecting telescope of the Newtonian form, of $9\frac{1}{4}$ -inches aperture and 6 feet 2 inches focus, the mounting of which exhibits certain peculiarities intended to improve the performance of such instruments, as well as certain contrivances calculated to render them



more portable than usual, and more readily available for general use. The principle upon which this mounting depends is applicable to any sort of telescope; but inasmuch as steadiness and smoothness of movement are of comparatively easy attainment in refractors, I propose only to lay before the Society my adaptation of it to reflectors.

The telescope is supported at both ends; the pivot on which